

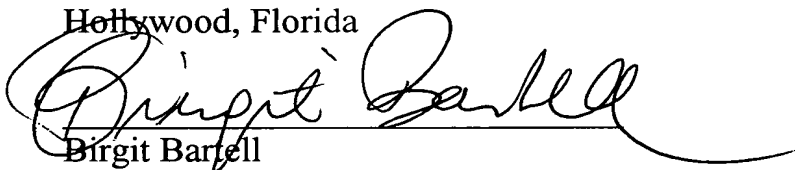
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CERTIFICATION

I, the below named translator, hereby declare that: my name and post office address are as stated below; that I am knowledgeable in the English and German languages, and that I believe that the attached text is a true and complete translation of PCT/EP2003/012964, filed with the Patent Office on June 2, 2005.

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Hollywood, Florida

A handwritten signature in cursive script, appearing to read "Birgit Bartell", is written over a horizontal line.

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WIPING DEVICE WITH DRIVE

5 The present invention relates to a device for wiping flat surfaces, in particular floors.

Floors with non-textile surfaces, but also other flat surfaces such as larger furniture surfaces, building roofs, floors of
10 basins, for example swimming pools and the like, are wiped by conventional means. As a rule cleaning should be carried out using dry or moist wiping. The invention is focused on wiping insofar as this is in connection with another surface treatment, for example with distributing a coating. The
15 invention is preferably aimed at wiping floors in the indoors area.

In conventional terms hand-operated wiping tools are used for such work, while motor-driven devices are also employed, which
20 have revolving wiping surfaces for example. Motorized devices can also have a wheel drive, by which the device is moved over the flat surface.

The technical problem on which the invention is based is to
25 provide an improved device for wiping flat surfaces.

The invention is focused on a device for wiping flat surfaces with a motor drive and a wiping surface, which is characterized in that the drive lies inside a web width covered by the wiping surface when the device is shifted by
5 the drive.

Preferred embodiments of the invention are illustrated in the dependent claims and in the following description. The invention also relates to a method for wiping floors. In the
10 following description, however, there is no individual distinction made between the device aspect and the method aspect of the invention, so that the entire disclosure is to be understood with respect to both categories.

15 In the device according to the invention, the drive is therefore arranged inside a web width covered by the wiping. This means in particular that the drive does not interfere outside the web width covered during wiping, if the wiping is to be done for example right along a floor edge. The invention
20 enables this edge to be approached by the wiping surface at a relatively small distance or even without wiping such a distance, because the drive, for example a wheel running between the web width covered by wiping and the floor edge as a drive component, is arranged inside the covered web width.
25 Here the drive wheel or the drive wheels are arranged inside the wiping surface such that a wiping cloth section is

connected downstream of the drive wheel or drive wheels in the direction of movement of the wiping surface. This effectively avoids "travel streaks" by the wheel or wheels.

5 The invention is aimed in particular at wiping at least approximately horizontal surfaces, and also those on which the wiping device remains held by gravity during its advance movement. At the same time the drive will to a considerable extent lie above the surface to be wiped. In particular the
10 drive is preferably arranged over the wiping surface, however it can also be arranged in the direction of movement in principle before or behind the wiping surface, as long as it remains in the web width.

15 The invention therefore also offers the possibility to provide a relatively wide wiping surface in relation to the size of the device essentially also determined by the drive.

The inventive wiping device preferably has narrow and long
20 outer measurements in terms of a projection onto the surface to be wiped, therefore clearly greater expansion in one direction than in a second direction perpendicular thereto. The ratio of the dimensions of the longest and the shortest side is preferably at least 2 : 1, and better still at least
25 2.5 : 1 and in the most favorable case at least 3 : 1. A preferred basic form of the device in projection onto the

surface to be wiped is a narrow long rectangle. Long, narrow external dimensions on the one hand allow a relatively great web width in the case of a not altogether large device on the other hand. In particular, the device can be inserted very
5 flexibly when threaded through narrow passages or when tight corners are being wiped out.

It is further preferred that the abovementioned external dimensions of the device be determined by the wiping surface,
10 so the wiping surface therefore forms the edges of the device in the plane of the surface to be wiped or at least substantially corresponds to the latter. At the same time it can be optionally provided that the wiping surface thus projects over an exchangeable wiping application, on one or
15 more sides via other parts of the device, and thus firstly enables particularly thorough wiping along floor edges and secondly forms a protective impulse edge. Other impulse edges can also naturally be provided, which are not formed by the wiping surface itself. In particular impulse edges equipped
20 with sensory properties can also be provided to direct automatic control of the wiping device to strike an obstacle and thus cause corresponding control reactions.

When it is operating, the wiping device moves forwards
25 preferably such that during a wiping motion one and the same longitudinal side points forwards. Therefore the maximal

possible web width is used for wiping and on the other hand the dirt collected during this cleaning is pushed before it. This preferably also applies during and after curved trajectories, so that the wiping device does not leave behind any wiping streaks in corners or curves. In particular, in a for example right-angled corner of a floor, first the wiping device can move with the abovementioned longitudinal side as far as the skirting board at the opposite edge, then return, rotate about 90° in the direction of the future direction of travel (so that the described longitudinal side now points forwards in the future direction of travel), and move in this rotated position along the edge back to the corner in order to then move on out of the corner in the new direction of travel. At the same time travel with a forward lying longitudinal side into the corner would be transferred to travel with the same forward lying longitudinal side out of the corner in the new direction of movement.

It can further be provided that as it operates the wiping surface moves in an oscillating fashion relative to the remaining device, for example swings or circles relative to a base of the device in one or also in two (horizontal or vertical) directions. Thus the mechanical effect on the floor can be increased, without the same path having to be covered repeatedly.

A further configuration of the invention provides fitting the wiping device not only on one side, but on two opposite sides with a wiping surface. The device can then be steered by corrective action by a user or automatically to be able to
5 continue with the second wiping surface.

It is also preferred that the wiping surface be continuous, and therefore form a coherent surface in the mathematical sense. In addition to this it is preferably closed in the
10 sense of the direction of movement behind the parts of the drive in contact with the floor, so that no traces are left by wheels, drive belts and the like. Such wheels or belts are therefore preferably provided inside the wiping surface or in the sense of the direction of movement in front of the latter
15 or respectively a part thereof.

The invention also focuses on an improved drive for moving the device over a surface, having a motor-driven inertial mass being mobile relative to a base of the device and is designed
20 to drive the device by moving the inertial mass relative to the base, in that during a part of these movements static friction holding the device on the surface by mass inertia of the inertial mass is overcome and during another part of these movements this does not occur, whereby the movements of the
25 inertial mass relative to the base are altogether iterative.

With the inventive inertia drive, mass inertia forces are utilized, which occur from relative movements between an inertial mass and a base to a certain degree forming the solid constituent of the device. These mass inertia forces in
5 certain phases result in static friction holding the device to the surface, on which it is to move, being overcome. In other phases, however, the mass inertia forces should not overcome the static friction. Movement phases and adhesion phases will be discussed hereinafter in simplified form. Depending on the
10 application system, inertial forces, which partly move the base and partly adhere to the surface, are therefore transferred to the latter through the movements of the inertial mass. Otherwise expressed, the movements of the inertial mass lead to a reaction of the base, because the
15 entire system is designed to correspond to the conservation of momentum. The conservation of momentum, however, is disturbed by the friction between the device and the surface. In the adhesion phases the base remains on the surface, in the movement phases it describes a movement on the surface. This
20 is preferably a sliding or skidding movement, and with corresponding static friction in the adhesion phases in wheel bearings or between wheel surfaces and the surface during the movement phases, however, it could also be a roll-away movement.

With the movements of the inertial mass relative to the base being iterative, therefore being repeated and thus enabling continued movement, a drive concept is created requiring no direct form or force-locking between drive components and the surface, on which the device is to be moved.

At the same time the aim can be in particular that the wiping device exclusively contacts the surface to be wiped with the wiping surface, because no wheels, drive belts or the like have to be employed.

For the sake of clarification it should still be pointed out that the inertial mass is a device component and should not be utilized by the inventive drive concept. An energy coupling is necessary to generate the movement, however the inertial mass should as such remain intact in contrast to recoil propulsion such as for example rocket drives or nozzle drives.

The invention thus enables sliding or rolling progression without coupling between drive and transport surface. This can for example be of interest if form-locking or force-locking with the transport surface can be made only with difficulty, on completely smooth surfaces, or if there is not supposed to be any contact between drive and surface with the inventive cleaning device.

There are different basic possibilities for the type of movement between the inertial mass and the base. For one, linear movements are conceivable, in which the inertial mass therefore is moved iteratively to and fro. Through
5 corresponding powerful acceleration or deceleration, inertial forces can be generated, which are above a threshold determined by static friction. In the case of lesser acceleration and deceleration, the device remains inside the static friction limits, so that the inertial mass can be
10 retracted in favor of a fresh movement phase of the device.

In this context it can be of particular interest to provide, in addition to the actual motor drive of the inertial mass, energy storage, in particular a mechanical spring, which is
15 charged and discharged with energy during the linear movements of the inertial mass, synchronously to these movements.

Firstly, at least portions of the energy used by the motor drive can be recovered. Secondly, for example the acceleration phase provided to overcome the static friction can be relieved
20 by correspondingly large forces by the energy storage, and the motor drive itself can serve purely as a return mechanism.

Thus the drive could press the inertial mass against the spring force and at the same time stress the spring, at which point the drive is switched off and the spring is allowed to
25 accelerate the inertial mass relatively strongly.

Furthermore, rotary movements between the inertial mass and the base are possible. Circular movements are preferred in this case. With rotary and in particular with circular movements there are two possible cases which might also occur jointly in principle. Firstly, the actual conservation of momentum in the sense of linear impulses, therefore in the sense of centrifugal force, can be utilized. Secondly, the angular conservation of momentum can also be utilized, wherein the base describes an angular momentum whenever the angular momentum of the inertial mass is altered. In the event of linear conservation of momentum in the foreground, the inertial mass is arranged eccentrically with respect to the rotary movement. If the angular conservation of momentum is to the fore, the inertial mass will lie concentrically with respect to the rotary intrinsic rotation. In each case here the inertial mass is understood as the center of gravity and not necessarily in its corporeal form. In the first case therefore for example increased acceleration of the inertial mass could be used in specific path regions, as in non-circular paths such as sunwheel paths or planet wheel paths, and in the second case for example by way of contrast with a change in direction of a concentric rotation of the inertial mass of the angular momentum acting on the base. In both cases a "jolt" to the base can be generated, which overcomes the static friction for a specific movement phase.

With the invention it is anyway not absolutely necessary, even preferred, that the movement phases, therefore the "jerking movements of the base" caused by the inertial masses are always substantially acting in the same direction (including acting in the same direction in the sense of rotary movements). In principle there are also cases conceivable, where static friction is overcome also within the scope of "retrograde steps", which however altogether lead to a lesser rearwards movement than the desired forward movement. By way of example the inertia drive could also overcome the static friction limit with inertial forces basically acting in the wrong direction. If the static friction limit in the desired direction is overcome for a longer time or at a greater speed, this does not in principle always stand in the way of progressive motion according to the invention.

It is particularly preferred to also use components of the utilized inertial forces to make use of the static friction between the device and the surface, on which it is to move. Through a corresponding configuration of movements, in particular their inclination, the device can become heavier or lighter, namely timewise and possibly also placewise, in precise terms being therefore pressed onto the surface by corresponding inertial forces or relieved in gravity. It is possible, in addition to or alternatively to the abovementioned use of particularly large inertial forces in

specific movement phases, to differentiate between movement phases and adhesion phases. By way of example constant inertial forces in the movement phases can lead to sliding of the device by components acting against gravitational force and in adhesion phases can lead to sticking by components working parallel to gravitational force.

Of particular preference is the use of at least two inertial masses in the above sense. In addition to the abovementioned aspects this allows a skilful combination of the respective inertial forces and phasewise addition or respectively compensation. By way of example two inertial masses with eccentric center of gravity moving in a circle can move in opposite directions and synchronously, so that their inertial forces compensate twice per full revolution and add twice per full revolution. Through additional tilting of the planes of rotation in the phases of addition in one case gravitation-parallel inertial force components and in another case gravitation-antiparallel inertial force components can be created, so that the device moves jerkily only or at least more strongly in the latter case.

The inertial masses are preferably suspended cardanically on the base in the case of rotary components. This can serve to tilt the rotation planes in the above-described sense.

Furthermore, through corresponding adjustment of the cardanic

suspension in contrast to a fixed unchangeable tilting, matching to the size of the static friction can also occur between the device and the surface, and in addition possibly necessary compensation of direction dependence of this static friction, for example with aligned wiping cloths. The cardanic suspension is adjusted preferably by motor and at the same time in particular can also happen automatically, in that to a certain degree the device tests the commencement of the movement phase and is adjusted according to given rotation movements by adapting the tilting automatically to optimal advance drive.

In the case of an inertia drive using linear conservation of momentum, therefore centrifugal force as well, it is preferred that the device move over the surface in stages with translatory individual steps, when straight movement of the device is attempted. In contrast to this it is provided when using the angular conservation of momentum to make use of an angular momentum component acting on the base, in that an end of the device serves as axis of rotation to a certain extent, and in that it is "loaded" by a surface-parallel angular momentum component acting on the base. In the next step an opposite end of the device can serve as an axis of rotation and an opposite aligned angular momentum acting on the base, i.e. a component standing perpendicular to the surface, can be used for a corresponding second step. The device would move

forward in this case for example with a right and a left side alternating stepwise and in each case rotating about the other side. The angular momentum components can be generated either by tilting rotating gyroscopes or - less preferred - by

5 accelerating or braking such gyroscopes.

Moreover, the device according to the invention must not necessarily be free of other drive or steering influences. By way of example in the case of the preferred application as a
10 cleaning device it can also be desired to provide an exertion of influence of an operator to the movement, for example by applying a style for steering or also for supporting movement. A motor-driven wiper with style would make it easier for cleaning staff on the one hand to push the wiper over the
15 surface to be cleaned, while on the other hand the wiper could also be very much heavier and thus more effective with respect to the cleaning action than a conventional manually operated wiper. However, an autonomous and automatically moved cleaning device with the abovementioned inertia drive is preferred.

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The present invention relates in addition to a unit for treating floors, which on the one hand has a motor-driven device, designated hereinbelow as a mobile device and which performs the actual treatment, and on the other hand has a
25 base station, serving to replenish the mobile device at specific distances covered. The mobile device is therefore

moved motor-driven over the floor area to be treated and returns at specific distances to the base station to be regenerated. The base station has a motor-driven transport device, configured to transport the mobile device into the
5 base station for replenishing and to transport it out of the base station.

The principle underlying the invention therefore consists of equipping the base station with a motor device for
10 transporting the mobile device in and out, even though the mobile device itself is motor-driven. In contrast to conventional units, in which the mobile device moves by means of its drive to the base station and "parks", for example on or under corresponding terminals for regenerating, the base
15 station according to the invention is fitted with its own motor mechanism, the transporting device. In this way the mobile device is brought into a specific position, with respect to the structural configuration of the base station and the structural configuration of the mobile device and its
20 drive itself, without consideration having to be made to the fact that the mobile device has to reach the appropriate position by means of its own drive. By way of example, the transporting device of the base station according to the invention can also raise the mobile device, for which its
25 drive will in many cases not be in a standing position. In addition, the transporting device in the base station, if

wanted or required, can apply relatively large forces, which the motor drive of the mobile device, powered for example by an electric storage battery or the like, cannot apply or can apply only if this drive is in an unnecessarily spacious
5 configuration.

The mobile device preferably has a wiping cloth, with which it wipes the floor for cleaning or for other reasons. The replenishing preferably includes the cleaning of the wiping
10 cloth or the exchange of the wiping cloth for a cleaned or a new wiping cloth. The term "wiping cloth" is to be understood in a very general sense and can include all possible fiber-based flat products, with which a floor can be wiped. These can therefore be non-woven fabrics, rags, lapped or paper-like
15 textiles and the like.

In an embodiment of the invention the base station contains an oblique plane, on which replenishing of the mobile device takes place and to which the mobile device is thus brought by
20 the transporting device. The oblique plane can ensure better access to the underside of the mobile device and facilitate cleaning or exchange of a wiping cloth or any other replenishing.

25 The motor-driven transporting device of the base station contains at least one and preferably two levers, designed to

grip the mobile device. The gripped mobile device is then pulled into or lifted into the base station by the lever.

The lever or both levers are preferably fitted with a
5 mechanism, which latches onto correspondingly designed recesses of the mobile device, when the latter is gripped. In the process the locking should preferably be released in the base station in the further course of transport of the mobile device, whereby the lever can also act to guide the
10 transporting in the base station after the locking is released.

By way of example, the lock mechanism can be a spring-loaded pin coupling. The joining pins can engage behind a
15 corresponding recess and lock onto an undercut. The joining pins are preferably provided on the levers and the recess with the undercut on the mobile device. The spring-loaded joining pins can be released from the locking by a further mechanical device in the base station, or also by an oblique plane on the
20 device of the base station with the undercut, over which oblique plane the pins can run up when correspondingly directed forces are exerted. After this the pins can for example run along in a groove without further undercut to thus serve as a guide.

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The base station preferably cleans the mobile device as follows: it guides it over a squeezing roller, by which the cleaning fluid still contained in a wiping cloth or previously applied for cleaning the wiping cloth is pressed out of the
5 wiping cloth, so that any associated dirt is removed at the same time. In the same manner this applies also for pressing out the treatment fluids which do not contribute to the cleaning. The squeezing roller is pressed onto the mobile device with a preferably adjustable pressure. By way of
10 example the squeezing roller can be mounted eccentrically or the guide mechanisms for the mobile device can be adjustable relative to the squeezing roller.

It is also preferred to newly moisten the wiping cloth with a
15 cleaning fluid or other fluid following this pressing out. In a particular embodiment, cleaning fluid is used, which is reused in the base station, and was therefore squeezed out at an earlier point in time. At the same time the base station can have a filter, in particular a continuous operation
20 filter, for the cleaning fluid.

Firstly, the new moistening can also serve through renewed squeezing out to repeat and improve the cleaning. Secondly, it can be desired to dampen the wiping cloth prior to fresh
25 wiping of the floor or to actually wet it. It is preferred in particular that the cleaning unit also carry out a two-stage

or multi-stage wiping procedure, in that the mobile device first wipes relatively wet and then absorbs the fluid still on the floor.

5 Furthermore, the base station can be fitted with an additional device enabling a wiping cloth to be exchanged, whereby it is taken out of an adhesive closure (so-called inclined closure or similar) on the mobile device. At this point further work is carried out using a new or respectively cleaned wiping
10 cloth, re-applied to the adhesive closure. This occurs in this particular embodiment automatically via the base station.

With the inventive unit the degree of dirtiness of the floor to be cleaned, of the used wiping cloth, the cleaning fluid in
15 the base station and/or of the filter for the cleaning fluid can be measured and monitored, which takes place preferably via respective optic or opto-electronic means.

The invention will now be illustrated by way of example
20 hereinbelow with reference to the figures. At the same time disclosed individual features can also be essential to the invention in other combinations. As already mentioned, the examples are focused both on inventive devices as well as methods.

25

In detail:

Fig. 1 is an illustration of the principle of an inventive inertia drive;

5 Fig. 2 is an illustration of the principle of a variant of Fig. 1;

Fig. 3 is an illustration of an inventive wiping device with an alternative inertia drive;

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Fig. 4 shows the wiping device of Fig. 3 in another state of movement;

Fig. 5 shows an alternative to the wiping device of Figs. 3 and 4;

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Fig. 6 is a fragmentary illustration of Figs. 3, 4 and 5;

Fig. 7 is a diagrammatic illustration of a further alternative inertia drive;

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Fig. 8 is yet another diagrammatic illustration of an alternative inertia drive;

25 Fig. 9 shows an example of a wheel drive;

Fig. 10 is an exploded illustration of a wiping device;

Fig. 11 is an illustration of the principle of an inventive base station;

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Fig. 12 is a more precise illustration of an inventive base station shown in side elevation;

Fig. 13 is a fragmentary illustration of Fig. 12;

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Fig. 14 is a further fragmentary diagrammatic illustration of an inventive base station;

Fig. 15 is a further fragmentary diagrammatic illustration of an inventive base station.

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Fig. 1 shows an illustration of the principle of an inventive inertia drive. In Fig. 1 a wiping device for moist wiping and thus cleaning of floors in a household or in other internal rooms is designated with 1. It is illustrated in Fig. 1 as a simple cuboid. The wiping device 1 lies on a floor 2 and is facing the latter with a wiping surface 3.

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Provided in the wiping device 1 is an inertial mass 4, here illustrated only symbolically, which is arranged mobile and horizontal in a manner not illustrated in greater detail. In

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the present case it is powered by a lever system 5 from a drive motor 6 and likewise illustrated only symbolically, and against the force of a spring 7. The drive motor 6 thus tenses the spring 7 to a certain point, whereupon a release mechanism 5 decouples the inertial mass 4 from the force of the drive motor or respectively clears the drive motor 6. At this point the spring 7 can accelerate the inertial mass 4 relatively quickly, and is directed to the left as in Fig. 1. During this acceleration phase a reaction force results on the base, i.e. the remaining wiping device 1, which accelerates the wiping device 1 to the right against the static friction between the wiping surface 3 and the floor 2 in terms of Fig. 1.

Due to the sliding friction between the wiping surface 3 and the floor 2 this movement is braked again after a certain glide path. The spring 7 has further pushed the inertial mass 4 away from itself, so that the drive motor 6 can move the inertial mass 4 to the right again via the lever system 5 to tense the spring 7. At the same time this results in such little acceleration of the inertial mass 4 to the right that tensing of the spring 7 does not lead to complementary jerky movement of the wiping device 1 to the left. With iterative repetition of the abovementioned procedure the wiping device 1 therefore skids to the right piece by piece between the wiping surface 3 and the floor 2 as the static friction is overcome. This accordingly explains the basic principle of the inertia

drive, and in particular with respect to a linear movement of the inertial mass 4 according to a model example.

Alternatively the movement of the inertial mass 4 could be
5 used by the drive motor 6 as inertial mass movement for the movement phase; the wiping device 1 is then moved therefore step-by-step to the left. The spring 7 is utilized here only as energy storage to return the inertial mass 4 to the starting position for renewed acceleration by the drive motor
10 6. The spring 7 acts on behalf of energy storage of any type, which can also be electric (condensers) for example. It should be clear that the energy for returning the movement does not necessarily have to originate from the drive motor 6.

15 Fig. 2 shows a very similar model, in which the same reference numerals are used as in Fig. 1. The difference in the mechanics illustrated in Fig. 2 from that in Fig. 1 is in the tilting of the movement track of the inertial mass 4 against the horizontal about the angle α . The result of this is that
20 during acceleration of the inertial mass 4 by the spring 7 a reaction force or a recoil power acts on the wiping device 1, and this force is likewise tilted about the angle α relative to the horizontal. It therefore has a component acting against gravitational force. Acting on the center of gravity of the
25 wiping device 1 therefore is not only a horizontal impulse

directed to the right but also an impulse directed vertically upwards. In concrete terms the wiping device 1 becomes lighter in this movement phase, i.e. the resulting force effective for the friction between the wiping surface 3 and the floor 2

5 lessens. Here it should be pointed out that due to the layout of the inertia drive influence can be made not only by intermittently greater and lesser deceleration and acceleration but also through its direction as to when the static friction is overcome and when not.

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A further alternative to the functions illustrated by way of Figs. 1 and 2 is to have the inertial mass 4 and the spring 7 describe self-oscillation as a linear oscillator via the drive motor 6, and preferably in a state close to resonance. In the

15 variant inclined about the angle α from Fig. 2 the desired adhesion phases and slide movement phases result as a consequence of the different influence of the static friction in both return points of this oscillation. In the variant in Fig. 1 the inertial mass 4 could for example be braked

20 relatively hard at one of the two return points, for example by a non-illustrated elastic wall or another comparatively harder spring. This would then result in correspondingly large deceleration forces, with which the static friction can be overcome.

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Fig. 3 illustrates another embodiment of an inertia drive. Here two inertial masses 4a and 4b are provided, mounted eccentrically and pivoting. Reference numerals 8a and 8b designate the axes of rotation of this rotary movement. At the same time the two inertial masses 4a and 4b rotate synchronously and in the opposite directions. It is evident that the rotation planes and the axes of rotation 8a and 8b are inclined. The synchronous rotary movements of the inertial masses 4a and 4b are in each case isochronous in the uppermost (shown in Fig. 3) and in each case the lowermost vertex. In the uppermost vertex the centrifugal forces are thus added to a gravitation-reducing vertical component and a horizontal component. The horizontal components are in each case designated by F_1 and the vertical components in each case by F_2 . The canted centrifugal force is designated by F_z . The centrifugal force can thus move the wiping device designated here by 9 by a specific slide path to the right. In the lowest vertex of the rotation paths of the inertial masses 4a and 4b in each case the centrifugal forces are also added, however here they reinforce the essential force of the wiping device 9 and vertical component of centrifugal force with respect to the static friction force resulting from gravity. Through opposite rotation of the two inertial masses 4a and 4b the inertial forces are compensated at least partially in the remaining area of the respective paths, so that the static friction likewise is not exceeded there. The slide phase

relates rather only to a specific temporal environment of the state in Fig. 3. Appropriate designing, i.e. matching between the friction coefficients, the masses, radii and speeds as well as path tilting angles of the inertial masses 4a and 4b can result in the wiping device 9 lying straight in these deepest vertices as a result of static friction. In this embodiment the iterative glide phases can therefore be achieved by continuous circular movement of the inertial masses.

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Fig. 4 shows the idle phase. Here the inertial masses are in each case in the deepest vertex of the respective circular movement.

15 Fig. 5 shows yet another wiping device 10 with an inertia drive, here illustrated only symbolically, which corresponds to the explanations of Figs. 3 and 4. Also symbolically illustrated are an electronic control 11 with a microprocessor for programming the wiping device, a storage device, an
20 assessment device for position and acceleration sensors or for collision sensors, arranged on the side edges of the wiping device 10, though not illustrated, as well as electronics for monitoring the power electronics designated by 12, which control the charging and discharging procedures of electrical
25 storage batteries and the motor drive of the inertial masses 4a and 4b. The specialist is fully familiar with the

electrotechnical details of such a control. The focus of the invention here is rather on the functioning of the inertia drive.

5 The wiping device 10 of Fig. 5 further shows on its underside not only a wiping cloth 13, whereof the underside forms the momentarily used wiping surface, but on the top side a further non-used wiping cloth 14 in the illustrated state. The wiping device 10 can therefore either be reversed by the user by hand
10 or by a base station described in detail hereinbelow to be able to wipe further with the second wiping cloth 14, if the other wiping cloth is dirty or worn. The wiping device illustrated here has a numerical ratio at the edges in projection on the floor of approximately over 3:1. This allows
15 narrow interstices to be thoroughly cleaned, and on the other hand achieves effective web widths on large surfaces.

In a plan view Fig. 6 illustrates a cardanic arrangement of the inertial masses 4a and 4b of Figs. 3 to 5. The "fixed"
20 base of the corresponding wiping device is indicated by 9 and 10. The direction of sight is from above to the floor plane. A first rotating shaft 15 holds a first cardanic ring 16, on which a second rotating shaft 17 is applied, which is rotated to the first rotating shaft 15 by 90°. The second rotating
25 shaft 17 holds a second cardanic ring 18, on which the inertial mass 4a or 4b, respectively, is pivotably mounted

about the axis of rotation 8a to 8b. The motor drive of the inertial mass 4a or 4b, respectively, takes place preferably via electromotors provided in the cardan bearings or also via flexible shafts, which are advanced by motors attached solidly to the base 9, 10, but which are not illustrated. The cardanic arrangement with the shafts 15 and 17 can be adjusted likewise by (not illustrated) servomotors via a lever system with levers set on the rings 16, 18 on the rotating shafts 15 or 17, respectively.

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Along with the explanations of the abovementioned Figs. 3 to 5 it follows that the wiping device 9, 10 can adapt to different friction ratios between respective wiping cloths or other wiping surfaces and different floors, even when these are dependent on direction, by adjusting the rotation speeds and the rotation planes. In particular the electronic control 11 can detect when the wiping device 9, 10 is moved and for example through increasing tilting of the rotation planes strive for a state, in which the static friction is overcome phasewise but still prevails phasewise. In addition, the wiping device 9 and 10 can be moved in any horizontal direction as a result of the cardanic bearing arrangement. It can easily also be imagined that turning the wiping device 9, 10 about a vertical axis can be attained by separate control of the rotation planes and/or the rotation phases of the two inertial masses 4a and 4b, in that the centrifugal force of

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the inertial masses is reversed at maximal gravitation-reducing vertical component or the superpositions with gravitation on both sides are different. Any superpositions from rotational movements and translatory movements can
5 naturally also be achieved.

For an angular momentum drive gyroscopes with a concentric center of gravity would have to be envisaged in Fig. 3 and in the following figures instead of the eccentrically suspended
10 inertial masses. Their angular momentum could lie for example substantially horizontally and could act through jerky change relative to the original position as angular momentum acting on the base with vertical direction. This vertical angular momentum could turn a part of the wiping device. If at the
15 same time an angular momentum component with horizontal direction provides for weighting an end, this could serve as an axis of rotation for a swiveling movement of the wiping device. Thereafter a further step could be made with reverse direction and at the corresponding other end of the wiping
20 device with weighting, resulting here also in an iterative progressive motion possibility.

The described drives are all arranged within and thus above the wiping surface.

Fig. 7 shows a further rotary movement of an inertial mass 19. The inertial mass 19 is connected eccentrically in a planet wheel 20, whereby the center of gravity is designated by 21. The planet wheel 20 runs on a fixed sun wheel 22, whereby the
5 middle point of the planet wheel describes a circular trajectory, however the center of gravity 21 describes an elliptical path 23 indicated in dashed lines. In the present case it can be envisaged that the axis of rotation of the planet wheel is driven by a belt drive designated by 24. Fig.
10 7 helps to clarify the fact that centrifugal force of varying magnitudes at different times can be achieved with the curve of the center of gravity of the inertial mass. Apart from this in its path movement the inertial mass can naturally also be accelerated or decelerated in the path speed itself. In
15 addition the abovementioned possibilities of mutual compensation of inertial forces of two or more inertial masses are taken into consideration.

As a result of aligning the longitudinal axis of the
20 elliptical path in Fig. 7 this drive would already produce an inertial drive also without canting the path plane and with only one inertial mass 19.

Fig. 8 shows a further example of a principle possibility of
25 an inertia drive. A wiping device in plan view is indicated symbolically by 25. In this is provided a bearing 26, in which

an eccentric sickle-shaped inertial mass 27 is guided to rotate. A movement of the inertial mass 27 can be achieved by a lever system (double crank with link) 28 via a motor connected at point 29. This movement is uneven with uniform
5 motor speed and correspondingly also leads to inertial drive of the wiping device 25 with glide phases and adhesion phases.

Fig. 9 shows an alternative drive, therefore not an embodiment of an inertia drive. Provided here inside a wiping device 30
10 is a wheel drive arranged inside the wiping surface (in the plan view of Fig. 9 corresponding to the wiping device 30), in which two wheels 31 and 32 can be driven independently of one another and can be turned relative to the wiping device 30.

The wheels are shown in two different positions, however there
15 are two wheels in all. The wiping device 30 with its wiping surface can thereby be transported across the floor, whereby any direction of movement and also rotations of the wiping device 30 about its own axis can be achieved by way of

differences in speed between the wheels 31 and 32 and by motor
20 adjustment of the angles of the axis of rotation of the wheels 31 and 32 relative to the wiping device 30. At the same time it must be ensured that the force-locking between the wheels 31 and 32 and the floor is adequately high in relation to the sliding friction of the wiping surface.

Fig. 9 shows in particular that with this drive an arrangement inside the wiping surface is also possible and tracks on the floor possibly caused by the wheels 31 and 32 can be wiped away later independently of the direction of movement. The
5 wiping surface is namely a surface closed in around the drive.

In particular it can be provided in connection with the wheel drive to have the wiping surface oscillate relative to the drive rotating or in some other way, in order to heighten the
10 mechanical cleaning action. An inertial mass can also be used for this purpose. In addition, the inertia drives can naturally be correspondingly replenished in the different examples.

15 Fig. 10 is a front view of a wiping device 33, which has a wiping cloth 34 projecting over the lateral edge of the actual wiping device 33. This wiping cloth 34 acts as edge protection and also delimits the dimensions of the wiping device 33 in projection onto the floor. This allows in particular
20 particularly efficient wiping along wall edges, without the danger of damage as a result of an impact to the wiping device 33. The wiping devices according to the invention can naturally and correspondingly also have impact protection edges independently of wiping cloths, which additionally can
25 take on sensory tasks in order to inform the abovementioned electronic control 11 of a collision with an obstacle.

Fig. 11 shows in principle a cross-sectional view illustrated in the line of sight of Fig. 10 through a base station 35 according to the invention for replenishing the wiping device 5 33. At the same time the wiping device 33 with the wiping cloth 34 is guided through between squeezing rollers 36, 37, 38. The distance between squeezing rollers 36 and 37 or respectively between the squeezing rollers 38 and 37 is adjustable, so that the force, with which the wiping cloth 34 10 is squeezed out, can be determined in an appropriate manner. At the same time the squeezing rollers 38 press on the wiping device 33 itself and the squeezing rollers 36 press on the projecting edges of the wiping cloth 34, with the squeezing rollers 37 forming a thrust bearing. The squeezed cleaning 15 fluid flows away downwards as indicated.

Fig. 12 shows a somewhat more concrete embodiment for the base station, designated here by 39. The wiping device 33 of Fig. 10 or for example also the wiping device 10 of Fig. 5 or the 20 wiping device 9 of Fig. 3 can be driven by means of its own drive into the position illustrated to the left in Fig. 12. There they are gripped by two levers 40, which can be tilted by motor as illustrated. At the same time spring-loaded pins explained in greater detail hereinbelow are latched behind 25 undercuts in the grooves 41 recognizable in Fig. 12 in the respective front regions of the longitudinal sides of the

wiping device 33. The lever 40 can thus grip the wiping device 33, can lift and tilt it and in the illustrated manner, at which the front end of the wiping device 33 is guided in between squeezing rollers 42 and 43. The squeezing rollers 42 and 43 draw the wiping device 33 further obliquely upwards, whereby the pilot pins unlatch from the catches and instead run on in the grooves 41 as a guide. The wiping device 33 is transported in this way to an oblique plane 44, whereby the squeezing rollers 42 and 43 squeeze out any residual moisture remaining in the wiping cloth 34.

The draining cleaning fluid flows away through a continuous filter 45 into a waste-water reservoir 46, from which the correspondingly cleaned cleaning fluid is supplied through the filter 45 by means of a pump 47 to a nozzle 48, which then sprays the cleaning fluid to improve cleaning prior to squeezing out and/or when the wiping device 33 returns to the wiping cloth 34. The transport of the wiping device 33 is also supported by an additional transport roller 49. A fresh-water reservoir 50 is also provided, containing for example clear fresh water for subsequent wiping and for rinsing and accordingly can be attached to the nozzle 48 in a manner not illustrated here. The cleaning unit can carry out multiple, first wet and then dry wiping in the manner already described.

The oblique movement of the wiping device 33 on the plane 44 enables easy transport of the wiping device 33 by means of the motor-driven lever 40 into the base station 39. The underside and thus the wiping cloth 34 of the wiping device 33 become
5 accessible and space is made for the above components under the plane 44. The hydraulic unit on the continuous filter 45, waste-water reservoir 46 and nozzle 48 as well as fresh-water reservoir 50 can be removed in its entirety as a module.

10 The distances between the rollers 42 and 49 relative to the rollers 43 are also adjustable for ensuring optimal squeezing out and adequate force-locking for transport. This means that the residual moisture in the cleaning cloth 34 can also be adjusted. The adjusting can be done for example by eccentric
15 cams in rotating shaft bearings.

Fig. 13 illustrates the abovementioned latch mechanism for gripping the wiping device 33 by the lever 40. At the lower left one of the two levers 40 is seen, which carries at its
20 end a pin 52 spring-loaded by a spring 51. It should be noted that compared to Fig. 12, Fig. 13 is laterally transposed. It is seen that in its initial region, therefore in the vicinity of its right end in Fig. 12 and left end in Fig. 13, the abovementioned groove 41 has an undercut 53, in which the pin
25 52 can latch. Locking in place is facilitated by a bevel 54 at the front of the groove 41. Unlocking from the undercut can

occur either via a similar bevel by means of the forces exerted by the squeezing rollers 42 and 43 or by means of further mechanical uncoupling, here indicated by the motor-driven fork 55. This can grasp the pin 52 and draw it out from the undercut 53. Thereafter the pin 52 glides along the groove 41 as a guide.

There are also other possibilities of course to transport the wiping device 33 motor-driven into a base station, possibly via portals, cranes, elevators, chain drives, pull ropes and the like. In particular a base station can also be designed to turn a wiping device with two wiping cloths (see Fig. 5) through 180°.

Fig. 14 diagrammatically shows that in a second compartment the base station 39 can also serve for changing the wiping cloth 34. Fig. 14 shows how the wiping cloth 34 is pulled out by two rollers 56 and 57 from inclined closures (not illustrated in greater detail) on the lower face of the wiping device 33 and laid into a container 58. Fig. 15 shows vice versa how the wiping cloth or a fresh wiping cloth 34 can be removed by a press roller 59 from a container 60 and applied to the adhesive closure. With both procedures transport of the wiping device 33 comparable to the explanations of Fig. 12 takes place in an oblique direction. Lever mechanics

corresponding to the explanations of Fig. 12 can also be employed.

The different motor-actuated movement steps in the base station 39 can be controlled by light barriers or similar sensors. As soon as the wiping device 33 is grasped, the typical current flows of the connected electromotors can also be utilized to draw conclusions about the respective movement phases.

As already mentioned, optical evaluations of the degree of contamination of the floor, of the wiping cloth, the cleaning fluid in the wiping cloth or also in the container 46, of the degree of contamination of the filter 45 and the like can be used.

Further to this, the base station 39 can be programmable for inputting specific residual moistures, cleaning cycles, wiping cloth data and the like. Wiping cloths may also contain transponders, which are read out into the base station.

The electronic control 11 of the wiping device, which can also be reprogrammed by electronic control of the base station, can control the wiping device (in whichever concrete construction) through consideration of known data or data of room dimensions and floor characteristics gathered on earlier runs. The user